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ABSTRACT

There are essentially four types of non-verbal communication: touching, moving, gazing (these are the truly "non-verbal modalities"), and para-linguistic aspects of vocalizing. These types of non-verbal communication are measured in five different dimensions: (1) frequency, (2) duration, (3) magnitude, (4) rates-frequency per time, (5) sequences-order of occurrence. All of these kinds of measurements deal with frequencies and relationships in time. Video-tape and film analyses are suggested as the best media for collecting and analyzing non-verbal behavior. Motion picture film is the best medium because it supplies a complete record, it is objective and fast, and it allows data analysis to proceed at any desirable speed and with any desirable level of detail. Direct data collection by hard-wiring monitors to computers is proposed as the path of the future because computers can collect quickly, and quickly process the vast quantities of data generated by non-verbal research. (Author)

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# NONVERBAL COMMUNICATION AND INTERPERSONAL RELATIONSHIPS - NEW DIRECTIONS IN FILM AND COMPUTER TECHNIQUES

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NONVERBAL COMMUNICATION AND INTERPERSONAL RELATIONSHIPS -
NEW DIRECTIONS IN FILM AND COMPUTER TECHNIQUES

During the past 15 years considerable research attention has been paid to nonverbal communication in several branches of social science. Sociologists, anthropologists, clinical psychologists, family therapists, developmental psychologists and social psychologists have all begun to attend to, and to generate data in this intriguing field. Within the past two years several books have appeared dealing with the topic, and I find it interesting that none of them have employed the term "nonverbal communication" in their titles. Authors have preferred terms like "body language," "bodily communication," "the body as a medium of expression," "messages of the body"; in general we seem to be uneasy about defining an area of studying negatively (communication that isn't verbal). I will use the term "nonverbal communication"--beset as it is with conceptual problems--because I have found that people think they know what you are talking about when you use it. The intent of this paper is not to review nor discuss the research findings that are beginning to emerge as the study of nonverbal communication progresses. I desire instead to address some conceptual and methodological issues regarding the study of nonverbal communication and to suggest some directions in which future research might move.

Nonverbal communication is an analogic medium, by contrast to verbal communication which is a digital medium. That is, nonverbal communication deals with emotional subtleties--the process of relationships rather than their content. The analogic nature of the data can mean that data are difficult to divide into discrete units and difficult to assess in terms of magnitude. There are essentially four types of nonverbal communication: touching, moving, gazing (these are the truly "nonverbal modalities"), and paralinguistic aspects of vocalizing. These types of nonverbal communication are measured in five different dimensions: (1) frequency, (2) duration, (3) magnitude, (4) rates--frequency per time, (5) sequences--order of occurrence. All of these kinds of measurement deal with frequencies and relationships in time.

## Collecting Nonverbal Data

Studying nonverbal data as a function of interpersonal relationships implies at least two people generating data. If we are studying family relationships and structure, more than two people will often be studied simultaneously. If we are going to study two or more people interacting socially, and record the frequency, duration, and magnitude of each gaze, and movement; and if we are going to be able to reconstruct these behaviors in time so that rates and sequences can be determined, several constraints are made on our data collection. First, we must be able to collect everything. Every movement, every eye blink, every shift of gaze for all the people we are studying. Second, our data collection must be objective. Since nonverbal communication is difficult to conceptualize and to talk

about (it is, after all, not verbal) objectivity implies using a medium of data collection that does not require a human interface. This is especially important while the study of nonverbal communication remains in its infancy, and we are trying to generate new concepts rather than analyze old concepts. Third, we must be able to record data as fast as they are produced.

These three constraints on data collection--completeness, objectivity, speed--eliminate direct observation and recording of nonverbal data. No observer, however well trained, can qualify under even two of the above three requirements.

The only media of data collection available at present which do qualify are video tape and film. Both these media capture all the behavior exhibited by all the participants and freeze them in time for later analyses.

The primary advantage of video tape is that multiple viewing is possible. A single observer can attend to one aspect of the data and review the data as many times as necessary to produce reliable results. A well trained observer, however, will usually pick up about 90 percent of the behavior he is analyzing if he observes in vivo. The primary advantage of video tape then, becomes the ability to attend to different behaviors on subsequent viewings. A single observer can monitor gazing behavior of Interactant A during one viewing and then, on subsequent viewings, monitor the gaze behavior of Interactants B and C, for example. Even with multiple viewings accurate duration and magnitude statistics are difficult to obtain using video tape because the replay occurs in real time.

The primary advantage of film as a medium of data collection compared to video tape is film can be viewed in slow motion. Slow motion cameras and hand operated movie viewers allow data analysis at any desired speed. For example, 16-mm motion picture film is exposed at the rate of 24 frames per second, allowing behavior to be timed to an accuracy of one frame, or 1/24th of a second. Film is a more expensive medium of data collection, $300+ an hour for black-and-white film compared to about $25 an hour for black-and-white video tape; but film is the only medium that qualifies under the three requirements for data collection and still allows the five different kinds of measurement which we have discussed earlier. In addition to the higher cost of film it is technically not as flexible as video tape. Special lighting is often required for filming and the camera can be aimed in only one direction at a time. By contrast, most video tape cameras utilize normal room lighting and with a special effects generator multiple video cameras can be used to produce a split screen effect so that two subjects who are looking at each other face to face can both be observed en face on the T.V. screen.

There is one technique which combines the versatility of the video tape with the accuracy of motion picture analysis: kinescoping (making 16-mm film copies of video tape). In the early days of television before video tape machines were invented the only way to "save" a T.V. program was on motion picture film. This process, called kinescoping, consisted of putting a 16-mm motion picture camera in front of a high contrast T.V. monitor and photographing the image on the monitor. With the advent of video tape this

procedure became "obsolete." Kinescoping machines across the country fell into disrepair and were often abandoned. We have been able to "resurrect" the kinescoping machine in the T.V. studios at Utah State University. The machine sat idle for many years until I came along with some video tapes which I needed to transform into motion picture film for analysis of nonverbal communication. Combining video tape data collection with kinescoping techniques has several advantages. Multiple camera, split screen techniques can be used during actual data collection, taking advantage of all the benefits of the video tape possibilities. Then, selected portions of the video tape can be selected for kinescoping. So, only movies of exactly the portions of data desired for analysis need to be made, which can result in substantial savings. I trust there are many other campus studio kinescoping machines which might be resurrected, in addition to those available from professional film makers.

The other medium that is being used with increasing frequency for collecting nonverbal data, and which I believe holds the keys to the major breakthroughs in this area of study is online computer data collection. With this kind of system a mini-computer is outfitted with a real time clock and data input can come from many sources: microphones, micro-switches, etc. Computers provide real time data collection, but they cannot monitor everything that is occurring in the interaction--at least at present--because we lack hardware with a necessary level of sophistication to be able to attend to all of the behaviors produced during social interaction. The primary value of computers can be realized if specific nonverbal behaviors can be isolated for study and the investigator can devise a means of allowing the computer to monitor those behaviors which conform to the requirements for data collection we have already mentioned.

Analyzing Nonverbal Communication Data

I suspect that we are faced with the same kind of problem that confronts psychophysicists when they want to know how sensitive the human eye is to light. The eye is so sensitive we cannot build instruments that are more sensitive and, therefore, cannot assess visual sensitivity accurately. I am convinced that the most efficient and sensitive instrument for analyzing the many subtleties of nonverbal communication is a "live human." As we have already noted, however, we cannot conceptualize and report on nonverbal data as fast as we can perceive them. Since the "human factor" dilemma is essentially a timing one--or a speed of processing one--video tape does not help much because it replays the data at the same speed at which they were emitted. The ideal, and in fact the only medium of data collection which supplies a complete record, is objective, and fast, and which allows data analysis at any desirable speed, is film.

At frequencies faster than 16 changes per second the human eye becomes unable to distinguish between discrete and continuous movement. Consequently, motion picture film which is exposed at 24 frames a second, for example, is collecting data on movement faster than a human eye can process them. This ability to collect behavioral data at a "pre-perceptual" level and then to allow data analysis at that level in super-slow motion makes films the ideal medium for collecting and analyzing nonverbal communication data.

Micro-behavioral analysis of social interaction using frame-by-frame film techniques is still only beginning. Already some fascinating findings are

beginning to emerge. Condon and Ogston (1967) reported their finding that the body of a speaker moves in synchrony with stress points in his speech; they also report an even more intriguing finding that the body of the listener also moves in synchrony with stress points in the speaker's speech. This "interactional synchrony" seems to be a fundamental property of human communication which begins at birth. Condon and Sander (1974) have found that infants coordinate their movements with adult speech, and recent research which I have conducted at Utah State indicates that infants also coordinate their movement with adult movement when no speech is present. We have also found that adults and infants engage in what we have called approach-withdrawal-approach behavior on a micro-kinesic basis (Peery, 1976). When the adult moves in towards the neonate's head, the head will turn away; and when the adult withdraws the neonate's head will turn towards the adult. Stern (1971) has found similar configurations with three-month old children. Interactional synchrony and approach-withdrawal-approach behavior are two examples of what I call "pre-conceptual nonverbal communication." That is, they are behaviors which are manifest by all subjects, they represent precise organizations of interactional movement, but they are on a level of organization which is not available to the individual's conscious awareness. It is only by micro-analysis of motion picture film that the "pre-conceptual" levels of behavioral organization can become manifest. It seems likely that behaviors organized on this micro-level will provide the building blocks for units of behavior which are conceptual, and which the individual does realize he is doing. Film analysis allows the investigator to analyze his data on any desired level from the micro- to the macro-behavioral.

There are two primary disadvantages of film analysis. First, the analyses are extraordinarily tedious and time consuming. There can be two or three body parts moving for each interactant and those movements can change direction or speed every two or three film frames. Obviously--at 24 frames per second--mountains of data can be generated (which might take years to analyze) during a single family meal time. The second major disadvantage is a function of the first, there is a time lag of one year or more between data collection and the availability of results. Family therapists are not likely to get too excited about talking with the family about three minutes of interaction which occurred a year ago; and by the time the developmentalist has his data in hand on his three-month old, the kid is approaching a year-and-a-half. While film is the ideal medium for data collection and analysis, the time lag problem forces us to search for and develop techniques which may lack something in completeness and precision but which will supply more rapid feedback.

Computers can deliver almost instant feedback. They can collect and store the data in vivo on a large number of variables, and provide data analysis shortly after a session ends, or even during a session. The disadvantages of computers are that they require human observers (pressing bottons for the duration of the behaviors being observed) or, if automated data collection is desired, computers require a hardware interface between the person generating the behavior and the computer. They also require a knowledge of which behaviors to monitor. At the current state of the art both these disadvantages are great. Aside from microphones and push buttons little hardware exists which could be used as an interface between human behavior and the computer. The computer could handle the data if we could get it to it, but we don't have those capabilities now. In addition,

we aren't sure exactly which behaviors are significant to which aspects of the interpersonal relationship. We need additional research, probably using film as the medium of data collection and analysis, to tell us what things are important to analyze. Additional disadvantages of computers are their limited portability and their high cost. Both these disadvantages are likely to be overcome as our technology improves.

More Problems, and Some Suggestions for the Future

First, I have some suggestions, then some problems, then some more suggestions. Suggestions first:

(1) Bring on the micro-behavioral studies of nonverbal communication using film as the medium of data collection (possibly via the kinescoping technique), and analysis. Those of us interested in families and in the processes of human development that take place within families are on a log raft in the middle of an uncharted sea when we look at the data available on nonverbal communication. The developmentalists have been more quick to see the necessity for a micro-level of analysis and the explosion of studies involving mother-infant interaction--which we are currently experiencing--is testimony to the developmentalists' awareness of the necessity for behavioral reductionism both in the age of the subject and in the kinds of dependent variables that are measured. Up to now it is the family therapists who have done the most to make us aware of the importance of interpersonal processes in family dynamics on a moment-to-moment basis, but for the most part they continue to use in vivo or real time-video tape techniques for data collection and analysis. We need to know how mothers relate to children; how fathers relate to children; how mothers relate to fathers; how the relationship between mother and father affects the children; how children relate to each other as siblings; we particularly need to know more about these relationships across time as they develop. And we need to assess these nonverbal relationships on a micro or "pre-perceptual" level.

(2) While we are waiting for appropriate interfaces between behavior and computers to be developed, let's not be too critical of the push button. Gaze direction can be analyzed better by an observer than by any mechanized technique of which I can conceive. Touching, gross body movement, distance between subjects--these can all be monitored by direct observation using the push button as the data collection device. The observer pushes the button for the duration of the behavior he is observing, then releases the button when the behavior is not occurring. The computer can then supply a timed record of each occurrence of the behavior and each epoch when the behavior was not present. What is required is one observer for each modality of nonverbal communication that is going to be studied, for each individual to be studied. Admittedly, that is a lot of observers standing around (they should probably be behind one-way mirrors) and the data they generate will lack something in reliability. But if you got discouraged about the prospects of analyzing ten minutes of data on a child once every six months for the first ten years of life using film as the medium of data collection and analysis (because it represents a lifetime's work), you should be cheered up at the prospect of doing that analysis via

computer which will begin handing you results almost as soon as you stop pushing buttons. Once again, there is so much we need to know, that we don't know, that this is one case where I would be willing to sacrifice some accuracy in reliability in order to get results in my lifetime.

(3) Throw away those tally sheets, stop watches, and pencils; and please get rid of that tape recorder that beeps in your ear every ten seconds. I might be able to tolerate push buttons and computers but I have no trust for reports where one observer (whatever his level of reliability, intra- or inter-rater) monitors several behaviors simultaneously or in one fixed time period. One observer for one behavior, and let the real time clock in the computer keep track of durations.

Now we come to some of the problems:

I have argued for behavioral reductionism and micro-analyses using either film or computer techniques, and I have argued against more macro-analyses where one observer attends to many variables as the interaction progresses in vivo. The basic motivation for the reductionistic argument is as follows:

I have talked about nonverbal communication on three different levels: the pre-perceptual, the pre-conceptual, and the conceptual. It is difficult to conceptualize and therefore to talk about nonverbal communication because concepts are verbal expressions. We develop a concept like "leaves", for example, because we do not have the time nor the energy to attend to all of those flat green things that exist in the world as though they were each separate individuals (even though it is true that each leaf on each tree is unique). Concepts help us to make abstractions of reality so that we can deal with the complexities of our perceptual input. It seems to me that nonverbal communication might also be called nonconceptual communication, and it is nonconceptual communication for at least two important reasons.

First, we communicate emotions which are often socially (and conceptually) not acceptable and/or which are often unconscious and about which we could not verbalize even if we wanted to. Two kinds of nonverbal processes come to mind immediately as an example, courting and quasi-courting behavior. Scheflen (1965) reports that psychotherapists and their patients engage in courting and quasi-courting behavior including grooming, hair straightening, sock pulling, and changes in posture; but the existence of these behaviors was often either unnoticed or denied by the psychotherapists when brought to their attention. Another example is aggression. How often do we smile and show our canine teeth to an individual communicating nonverbally, "I would like to bite your head off, Charlie," while at the same time we say, "Nice set, Charlie. Your serve was really on today." Second, in addition to those communications which we defend against there are those communications which remain at a pre-conceptual level, like interactional synchrony, and approach-withdrawal-approach behavior, and of which we are consciously unaware and for which we have no conceptual interpretation when they are brought to our attention. These pre-conceptual behaviors comprise an important part of our social interaction.

Research which collects data on variables about which we have concepts is likely to miss the nonverbal organization of behavior that exists at these pre-conceptual levels. Such macro-behavioral research will probably be able to distinguish between trees and rocks but never be able to distinguish between apple trees and pine trees.

In order to study pre-conceptual, nonverbal communication we need to collect data at a pre-perceptual level using film; or we need to collect data on the interaction of many variables in vivo which can be done by using multiple observers (each attending to one aspect of nonverbal communication) with each of these being monitored and synthesized by a computer.

May I end with some final suggestions:

One of the goals of detailed micro-analyses of nonverbal communication is to develop a lexicon (movicon?) to identify individual behaviors. We then need to develop rules of nonverbal "syntax" that identify how these behaviors are organized into patterns, how these patterns fit into sequences, and so on. The theory builder can have a heyday.

Finally, and perhaps most importantly, we need to build bridges which correlate studies between standard measures--interviews, test instruments, questionnaires--and nonverbal measures. As we move forward in our analyses of nonverbal communication from the pre-perceptual to the pre-conceptual, to the conceptual, it is vital that we relate our new concepts about nonverbal communication to our concepts and research findings about all of the other variables that affect individuals and their families and their relationships. I expect we will also have to modify some old concepts in light of nonverbal findings. Building bridges between the domains of nonverbal communication and developmental psychology, family counseling, and family sociology is one of the exciting prospects which I believe the next 50 years holds for all of us.

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